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the difunctional cyclotetrasiloxanes within the scope of Formula 2 are, for example, 1,5-divinyl-1,3,3,5,7,7-hexamethylcyclotetrasiloxane; 1,5-dihydro-1,3,3,5,7,7-hexamethylcyclotetrasiloxane; 1,5-diallyl-1,3,3,5,7,7-hexaphenylcyclotetrasiloxane; 1,5-dihydro-1,3,3,5,7,7-hexaphenylcyclotetrasiloxane; 1,5-divinyl-1,5-diphenyl-3,3,7,7-tetramethylcyclotetrasiloxane, etc.

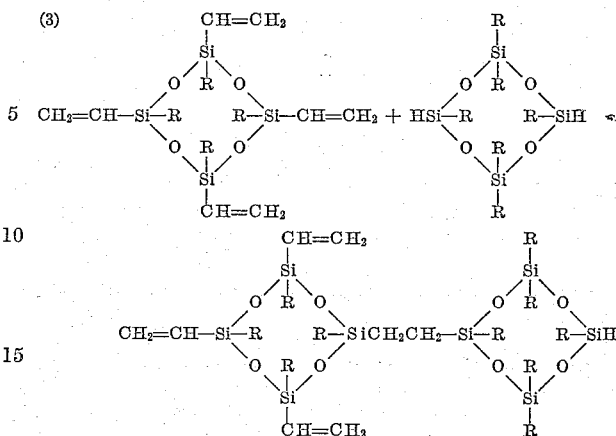
The cyclotetrasiloxanes within the scope of Formula 1 and Formula 2 can be formed by conventional means and these cyclic siloxanes are known in the art. For example, the tetrafunctional cyclotetrasiloxanes within the scope of Formula 1 can be prepared by the hydrolysis and condensation of a silane containing two silicon-bonded chlorine atoms, one silicon-bonded hydrogen atom and one silicon-bonded monovalent hydrocarbon radical within the scope of R of Formula 1. This hydrolysis and condensation product is fractionally distilled to produce tetrafunctional cyclotetrasiloxanes within the scope of Formula 1. Likewise, tetrafunctional cyclotetrasiloxanes within the scope of Formula 1 can be prepared by the hydrolysis and condensation of silanes containing two silicon-bonded chlorine atoms, one silicon-bonded monovalent hydrocarbon radical within the scope of R, and one silicon-bonded alkenyl radical within the scope of R'. Fractional distillation of the hydrolysis and condensation product will yield the cyclotetrasiloxanes within the scope of Formula 1.

The difunctional cyclotetrasiloxanes within the scope of Formula 2 are prepared by the cohydrolysis and cocondensation of a mixture of organochlorosilanes, one of which contains two chlorine atoms and two silicon-bonded monovalent hydrocarbon radicals within the scope of R of Formula 2 and the other of which contains two silicon-bonded chlorine atoms, one silicon-bonded R group and one silicon-bonded hydrogen atom or silicon-bonded alkenyl radical within the scope of R'. Generally, these two types of silanes are mixed in equal proportions and the resulting cohydrolysis and cocondensation product is fractionally distilled to produce the difunctional cyclotetrasiloxane of Formula 2.

The organopolysiloxane resins within the scope of the present invention are prepared by effecting reaction between a tetrafunctional cyclotetrasiloxane within the scope of Formula 1 and a difunctional cyclotetrasiloxane within the scope of Formula 2. The reaction involved is an addition reaction in which the silicon-bonded hydrogen atoms of one of the cyclotetrasiloxanes react with the olefinic double bond of the other cyclotetrasiloxane to form an alkylene linkage or bridge between the two cyclotetrasiloxanes. It is immaterial, for purposes of the present invention, whether the silicon-bonded hydrogen atoms are attached to the tetrafunctional cyclotetrasiloxane or to the difunctional cyclotetrasiloxane. Likewise, it is immaterial as to whether the silicon-bonded alkenyl radicals are attached to the tetrafunctional cyclotetrasiloxane or the difunctional cyclotetrasiloxane. The only requirement for the preparation of the organopolysiloxane resins of the present invention is that one of the two cyclotetrasiloxanes contain all of the silicon-bonded hydrogen atoms and that the other of the cyclotetrasiloxanes contain all of the silicon-bonded alkenyl radicals.

To illustrate the first stages in the preparation of the organopolysiloxane resins of the present invention, there is shown below the reaction between one molecule of a tetrafunctional cyclotetrasiloxane and one molecule of a difunctional cyclotetrasiloxane. In Formula 3 below is shown the reaction between a tetrafunctional cyclotetrasiloxane containing a vinyl radical attached to each of its silicon atoms and a difunctional cyclotetrasiloxane containing a hydrogen atom attached to the 1- and 5-silicon atoms. This addition reaction results in the joining of the two molecules through an alkylene (ethylene) radical which is attached to one silicon atom of each of the two cyclotetrasiloxanes through silicon-carbon linkages.

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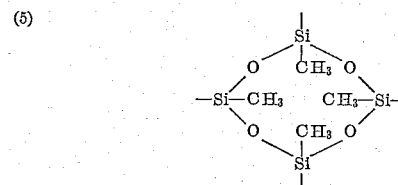


As the reaction of Formula 3 is continued through the reaction of other molecules of the tetrafunctional cyclotetrasiloxane and difunctional cyclotetrasiloxane of the type shown in Formula 3, it is seen that another vinyl-containing tetrafunctional cyclotetrasiloxane molecule can react with the silicon-bonded hydrogen atom on the right hand silicon atom of the product of formula 3 and that other difunctional cyclotetrasiloxane molecules containing silicon-bonded hydrogen atoms can react with the silicon-bonded vinyl radicals in the product of Equation 3. This procedure is repeated until a complicated cross-linked structure is formed. This cross-linked material is the organopolysiloxane resin of the present invention.

To illustrate the structure of a portion of the organopolysiloxane resins of the present invention in a simplified fashion, consider that the symbol:



represents the radical:



When effecting reaction between 1,5-divinyl-1,3,3,5,7,7-hexamethylcyclotetrasiloxane and 1,3,5,7-tetrahydro-1,3,5,7-tetramethylcyclotetrasiloxane and using the symbol of Formula 4, it is seen that the structure of a portion of the resinous material within the scope of the present invention would have the structure:

